Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Final Examination
Year 2, Semester 1 (2022)

IT2040 – Database Management Systems

Duration: 2 Hours

June 2022

Instructions to Candidates:

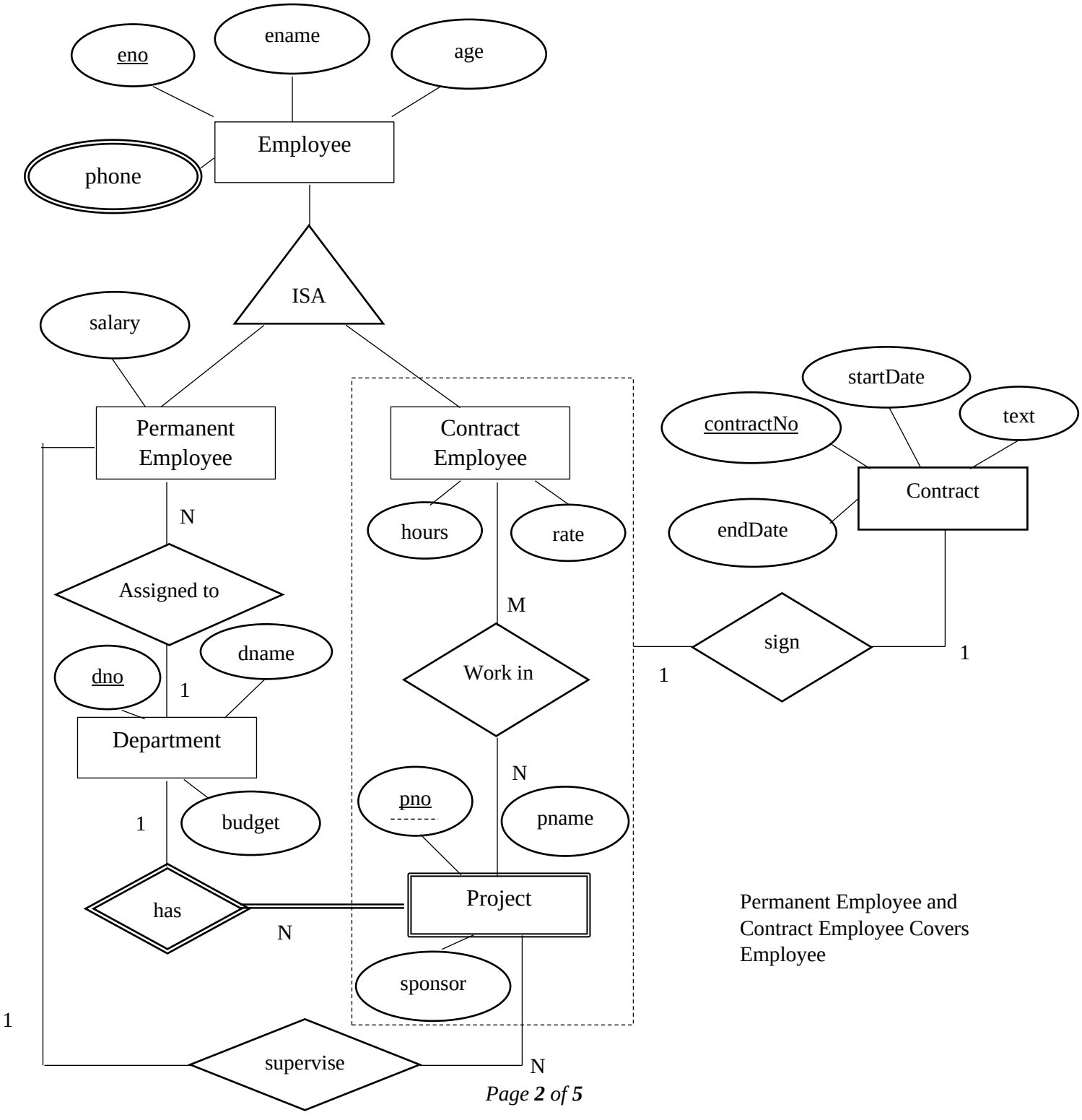
- This paper is preceded by 10 minutes reading period. The supervisor will indicate when answering may commence.
- This paper has 4 questions.
- Answer all questions in the booklet given.
- The total marks for the paper is 100.
- This paper contains 5 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 1 (20 marks)

Consider the following EER Model.

a) Convert the following EER model in to the relational model. Indicate the primary keys and the foreign keys of the resulted relations clearly. (16 marks)

b) What is the best option for mapping the ISA hierarchy in the diagram? Justify your answer. (4 marks)



Question 2 (15 marks)

Consider a relation **R (A, B, C, D, E, F)** with the following set of functional dependencies over **R**:

F = {A → CD, B → E, F → A}

a) Find all the keys in relation R using attribute closure method. (4 marks)

b) Is **R** in 3NF? Give reasons for your conclusion. (3 marks)

c) Is **R** in BCNF? Give reasons for your conclusion. If R is not in BCNF, convert it to a set of BCNF relations. (8 marks)

Question 3 (25 marks)

a) "In a Type 2 JDBC driver, a vendor specific driver must be installed on each client machine" Accept or refute the above statement justifying your answer. (2 marks)

b) There are several different statements in the JDBC API to retrieve the result set based on different requirements. Which type of statements is used in the code segment given below? Briefly explain when this type of statements will be used. (2 marks)

```
String query = "Update Employee SET type= ? WHERE empId = ?"; PreparedStatement psObject
= connObj.prepareStatement(query);
ResultSet rsObject = psObject.executeQuery();
```

c) Briefly explain two types of backups that could be taken in SQL server. (2 marks)

d) Briefly explain what schedules and jobs are. Suggest a situation where using a schedule is useful and when will the schedule be executed. (3 marks)

e) A software company has been assigned the responsibility of automating the tasks of a leading private school.

This includes designing and developing a database for the school to maintain the records of various activities. It also maintains records of all students, details about staff, details about student marks, and details about timetables.

Kasuni, a senior DBA is assigned to the project to handle all the administrative tasks related to the databases by the database architect.

Kasuni creates the required database and assigns Saman the responsibility of managing the SchoolDB. Since there will be a lot of users for the project, Aruni is assigned the responsibility of handling logins to the system.

Saman assigns Thusitha the responsibility of creating tables. In addition, Thusitha should be able to create views, stored procedures, and triggers required. Lasitha, who is a data entry operator is given the responsibility of inserting the data into the table. Lasantha is assigned the responsibility of generating reports from the table in the data. For the above purpose, Lasantha could directly query the data or call functions and procedures.

i. Write a T-SQL statement to create a login to Kasuni. (2 marks)
ii. Provide permission using fixed server role to handle all the administrative tasks in the server to Kasuni. (3 marks)
iii. Assuming that Saman has the user name saman.a, write a T-SQL statements required to assign him with the responsibility of handling the SchoolDB using user defined server role. (5 marks)
iv. Assuming that Thusitha has a login name thusitha.p write T-SQL statements required to allow him to create tables, functions, procedures and triggers. (3 marks)
v. Assuming that Lasantha has a login name Lasantha.h, write T-SQL statements required to perform the tasks he is responsible of. (3 marks)

Question 4 (40 Marks)

Consider the following schema of a database designed for a manufacturing company

Customer (*CID*:int, *name:* varchar(50*)*, *gender:* char(1), *address:* varchar(50, creditLimit:int*)*)

Manufacturer (*MID:*char(10), *name:* varchar(50), *country:* varchar(50), *contact:* char(10))

Product *(PID:* varchar(20), *name:* varchar(50), *color:* varchar(10), *weight:* int, *warranty*: int, *unitPrice:* int, *MID:* char(10), *manufacturedDate*: date)

Order (*OID:* char(10),*CID:* varchar(20), *orderDate:* date)

OrderItems (*OID*: char(10), *PID*: varchar(20), *qty*: int)

Customer table consists of ID (*CID*), *name*, *gender*('M' for male and 'F' for female), *address* and credit limit(creditLimit) of all customers. **Manufacturer table** consists of the ID (*MID*), *name*, *country* and contact number (*contact*) of all manufacturers. **Product table** stores information of all the products manufactured. The table stores the ID *(PID*), *name*, *color*, *weight* in grams, *warranty* in years and unit price(*unitPrice*) of all products along with the ID of the manufacturer(*MID*) and the

date the product is manufactured (*manufacturedDate*). **Order** table stores the ID of the order (*OID*), ID of the customer who has placed the order (*CID*), and the date the order was placed(*orderDate*).**OrderItems table** stores the product ID (*PID*) and quantity (*qty*) of the product in an order along with the order ID (OID). All primary keys are underlined.

a) Write SQL queries to answer following questions.
   i. Display the order IDs of orders and the name of female customer from France who placed them. (4 marks)
   ii. Find the IDs of the customers who had not ordered 'phones' manufactured by manufacturers from India. (6 marks)
   iii. Find the name and credit limit of the customers who had ordered more than 10 items in a single order. (7 marks)

b) Create a function which calculates and returns the total price to be paid for an order given the order ID. (10 marks)

c) Assuming that the orders are delivered as packages, create a trigger to ensure that the weight of the package does not exceed 2kgs. (13 marks)